Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

GCSE
BIOLOGY

F

Foundation Tier Paper 1F

Tuesday 16 May 2023 Morning Time allowed: 1 hour 45 minutes

Materials
For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Do not write outside the box

Answer **all** questions in the spaces provided.

0 1 Plants are made of cells, tissues and organs.

0 1 . 1 Which part of a plant is the largest?

[1 mark]

Tick (✓) **one** box.

A guard cell ☐

A leaf ☐

A root hair ☐

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

Table 1 shows the results.

Table 1

Solution	**Change in mass of piece of potato in grams**			
	Test 1	**Test 2**	**Test 3**	**Mean**
Dilute salt solution	1.1	1.1	1.4	**X**
Concentrated salt solution	–7.2	–6.8	–32.4	–7.0

Do not write outside the box

0 1 . 2 Calculate mean value **X** in **Table 1**.

[2 marks]

_____

_____

_____

_____

X = _____ grams

There is an anomalous result for the concentrated salt solution in **Table 1**.

0 1 . 3 Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 1 . 4 What did the students do with the anomalous result when calculating the mean in **Table 1**?

[1 mark]

_____

0 1 . 5 What name is given to a variable that is kept the same during an investigation?

[1 mark]

Tick (✓) **one** box.

Control variable ☐

Dependent variable ☐

Independent variable ☐

Question 1 continues on the next page

Do not write outside the box

0 1 . 6 One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same?

[1 mark]

Tick (✓) **one** box.

Change in mass of pieces of potato ☐

Concentration of salt solution ☐

Time in the salt solution ☐

0 1 . 7 The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the box.

[1 mark]

excretion	**osmosis**	**respiration**

Water moved out of the potato by the process of _____.

Do not write outside the box

0 1 . 8 The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane?

[1 mark]

Tick (✓) **one** box.

No particles ☐

Some particles ☐

All particles ☐

0 1 . 9 How could the students improve their investigation?

[1 mark]

Tick (✓) **one** box.

Boil the pieces of potato at the start. ☐

Leave the skin on some pieces of potato. ☐

Use more concentrations of salt solution. ☐

10

Turn over for the next question

Do not write outside the box

0 2 Viruses cause disease.

0 2 . 1 What name is given to microorganisms that cause disease?

[1 mark]

Tick (✓) **one** box.

Pathogens ☐

Predators ☐

Producers ☐

0 2 . 2 The body has defences to stop viruses entering.

Draw **one** line from each defence to the part of the body that provides the defence.

[2 marks]

Defence	**Part of the body that provides the defence**
	Brain
A physical barrier that stops viruses entering	Heart
Mucus that traps viruses	Nose
	Skin

Do not write outside the box

Some viruses can cause tumours to develop.

0 2 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

digestion	**division**	**metabolism**

A tumour can form when changes to cells cause uncontrolled

cell _____.

0 2 . 4 Malignant tumours are cancers.

Which **two** sentences describe malignant tumours?

[2 marks]

Tick (✓) **two** boxes.

- Malignant tumours are only found in the reproductive system. ☐
- Malignant tumours contain digestive enzymes. ☐
- Malignant tumours do not change in size. ☐
- Malignant tumours have cells that can spread to other parts of the body. ☐
- Malignant tumours may form secondary tumours. ☐

Question 2 continues on the next page

Do not write outside the box

HPV is a virus that can cause one type of cancer in females.

In the UK since 2008, most 12 to 13-year-old females have been vaccinated against HPV.

Scientists investigated the percentage of 16 to 18-year-old females with HPV.

Table 2 shows the results.

Table 2

Year	Percentage (%) of 16 to 18-year-old females with HPV
2010	8.2
2012	3.2
2014	2.0
2016	1.6

0 2 . 5 What does **Table 2** show about the percentage of females with HPV from 2010 to 2016?

[1 mark]

_____

_____

0 2 . 6 Suggest the reason for the change you described in Question **02.5**.

[1 mark]

_____

_____

Do not write outside the box

The HPV vaccine contains an inactive form of the virus.

The inactive form of the virus is injected into the body.

0 2 . 7 Which part of the blood responds to the inactive virus?

[1 mark]

Tick (✓) **one** box.

Platelets ☐

Red blood cells ☐

White blood cells ☐

0 2 . 8 What is produced by the body in response to the inactive virus?

[1 mark]

Tick (✓) **one** box.

Antibiotics ☐

Antibodies ☐

Antiseptics ☐

0 2 . 9 Suggest **one** reason why some **parents** refuse to allow their children to have the HPV vaccine.

Do **not** refer to the pain of the injection in your answer.

[1 mark]

_____

_____

11

Turn over for the next question

Do not write outside the box

0 3 Photosynthesis produces oxygen.

0 3 . 1 Complete the word equation for photosynthesis.

Choose answers from the box.

[3 marks]

carbon dioxide	**fat**	**glucose**
nitrogen	**protein**	**water**

_____ + _____ → _____ + oxygen

0 3 . 2 Explain how oxygen is used in cells.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

A student investigated the effect of light from different coloured light bulbs on photosynthesis.

The student:

- used pondweed in a beaker of water
- used different coloured light bulbs in a lamp
- counted the number of bubbles of oxygen the pondweed produced in 2 minutes for each colour of light bulb.

0 3 . 3 Give **one** hazard the student would need to consider when using the apparatus in this investigation.

Give the risk the hazard would cause.

[2 marks]

Hazard _____

_____

Risk _____

_____

0 3 . 4 The student needed to keep the temperature of the water in the beaker the same throughout the investigation.

Describe how the student could keep the temperature of the water the same.

[1 mark]

_____

_____

0 3 . 5 The beaker of water contained the pondweed.

Explain why the temperature of the water in the beaker needed to be kept the same throughout the investigation.

[2 marks]

_____

_____

_____

_____

Turn over ►

Do not write outside the box

Table 3 shows the results.

Table 3

Colour of light bulb	Number of bubbles of oxygen produced in 2 minutes
Blue	46
Green	8
Red	38
Yellow	29

0 3 . 6 Which colour of light caused the highest rate of photosynthesis in the pondweed?

[1 mark]

Tick (✓) **one** box.

Blue ☐

Green ☐

Red ☐

Yellow ☐

0 3 . 7 What is the best way to display the data in **Table 3**?

[1 mark]

Tick (✓) **one** box.

Bar graph ☐

Line graph ☐

Scatter graph ☐

Do not write outside the box

0 3 . 8 The student wanted to measure the **volume** of oxygen the pondweed produced in 2 minutes.

Name **one** piece of apparatus the student could use to measure the volume of oxygen.

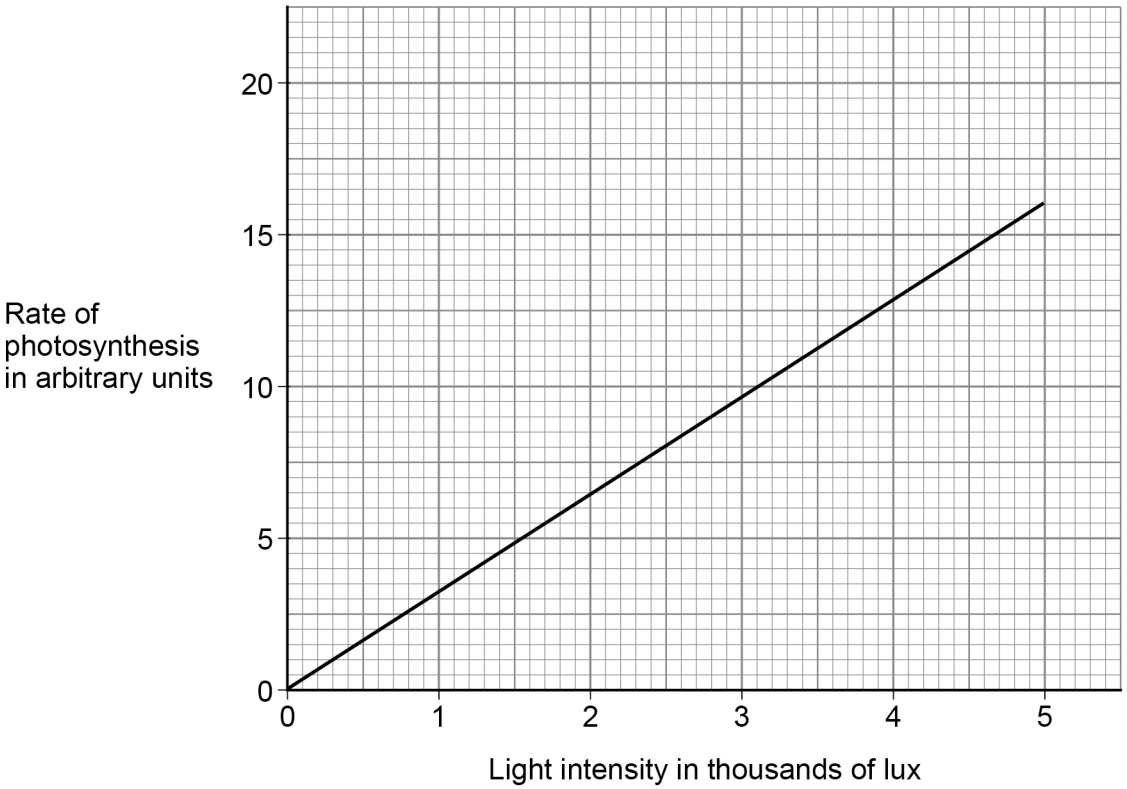
[1 mark]

_____

0 3 . 9 Another student investigated the effect of light intensity on the rate of photosynthesis.

Figure 1 shows the results.

Figure 1



Describe what **Figure 1** shows about the relationship between light intensity and the rate of photosynthesis.

[2 marks]

_____

_____

_____

_____

15

Turn over ►

Do not write outside the box

0 4 Malaria is caused by a protist.

The protist is passed from one person to another person by mosquitos.

0 4 . 1 Which term describes the mosquito?

[1 mark]

Tick (✓) **one** box.

Bacterium ☐

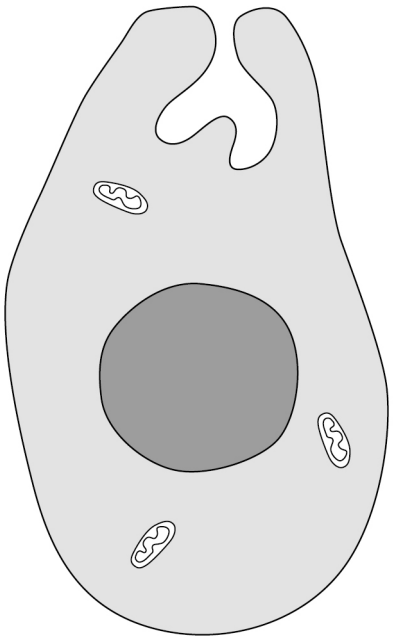
Gene ☐

Vector ☐

0 4 . 2 The malarial protist is a eukaryotic cell.

Figure 2 shows a malarial protist.

Figure 2



Do not write outside the box

Give **two** features of the malarial protist that show the cell is eukaryotic and **not** prokaryotic.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 3 Which organism is prokaryotic?

[1 mark]

Tick (✓) **one** box.

Cow ☐

Grass ☐

Salmonella ☐

0 4 . 4 The malarial protist reproduces asexually.

What is a feature of asexual reproduction?

[1 mark]

Tick (✓) **one** box.

Only one parent is involved. ☐

The offspring show genetic variation. ☐

Two gametes fuse. ☐

Question 4 continues on the next page

Do not write outside the box

0 4 . 5 Mitosis occurs in the malarial protist during asexual reproduction.

The protist has 14 chromosomes.

How many chromosomes will each new protist cell have after mitosis?

[1 mark]

Tick (✓) **one** box.

7 ☐ 14 ☐ 21 ☐ 28 ☐

0 4 . 6 When a person has malaria, the protists destroy red blood cells.

What change would happen in the blood of a person with malaria?

[1 mark]

Tick (✓) **one** box.

Decreased antibodies ☐

Decreased haemoglobin ☐

Increased plasma ☐

Increased platelets ☐

Do not write outside the box

0 4 . 7 It is estimated that 210 million people are infected with malaria every year. Half of these infected people survive the disease.

Calculate how many people would survive the disease in 3 years if the estimate is correct.

Give your answer in standard form.

[4 marks]

Number of people (in standard form) = _____

0 4 . 8 The spread of malaria can be controlled by using mosquito nets to avoid being bitten.

Describe **two** other ways that people can reduce the chance of being bitten by mosquitos.

Do **not** refer to mosquito nets in your answer.

[2 marks]

1 _____

2 _____

Question 4 continues on the next page

Do not write outside the box

0 4 . 9 Different types of disease may interact.

Scientists studied how having disorder **S** interacts with malaria.

The scientists calculated the chance of children with disorder **S** getting malaria.

Table 4 shows the results.

Table 4

Age in years	Percentage (%) chance of children with disorder S getting malaria
2	70
4	65
6	50
8	45

Describe the trend shown in **Table 4**.

Use data from **Table 4**.

[2 marks]

_____

_____

_____

_____

15

Do not write outside the box

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 5 This question is about food and digestion.

0 5 . 1 Proteins are needed to make new body cells by mitosis.

Give **one** reason why a person needs new body cells.

[1 mark]

_____

_____

0 5 . 2 What are proteins made of?

[1 mark]

Tick (✓) **one** box.

Amino acids ☐

Fatty acids ☐

Glucose ☐

Starch ☐

0 5 . 3 Which chemical is used to test for protein in food?

[1 mark]

Tick (✓) **one** box.

Benedict's reagent ☐

Biuret reagent ☐

Ethanol ☐

Do not write outside the box

0 5 . 4 What colour would be seen in a positive test for protein?

[1 mark]

Tick (✓) **one** box.

Black ☐

Purple ☐

Red ☐

White ☐

Enzymes break down food molecules in the human body.

0 5 . 5 Characteristics of enzymes are linked to their function.

Draw **one** line from each characteristic to its effect on enzyme function.

[2 marks]

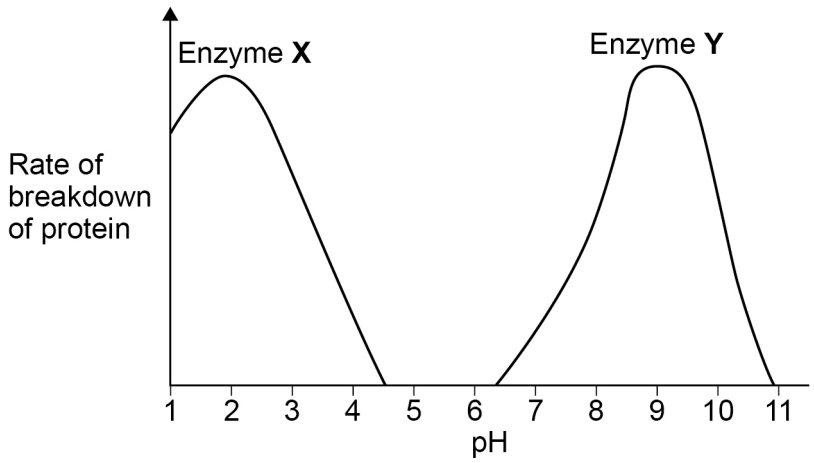
Characteristic	**Effect on enzyme function**
Has a special shape	Only fits one molecule
Is a catalyst	Speeds up reactions
	Works fast at high pH

Question 5 continues on the next page

Do not write outside the box

Figure 3 shows how pH affects the rate of breakdown of protein.

Figure 3



0 5 . 6 Which pH does enzyme **Y** work fastest at?

[1 mark]

pH = _____

0 5 . 7 Explain why enzyme **X** works best in the stomach.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

0 5 . 8 Complete the sentences.

Choose answers from the box.

[2 marks]

active site	**antigen**	**glucose**	**starch**	**substrate**

Enzyme **Y** does **not** break down protein at pH 6 because the shape of the enzyme has changed.

The part of the enzyme that changes shape is

the _____.

The change in shape means the enzyme cannot bind to

the _____.

Question 5 continues on the next page

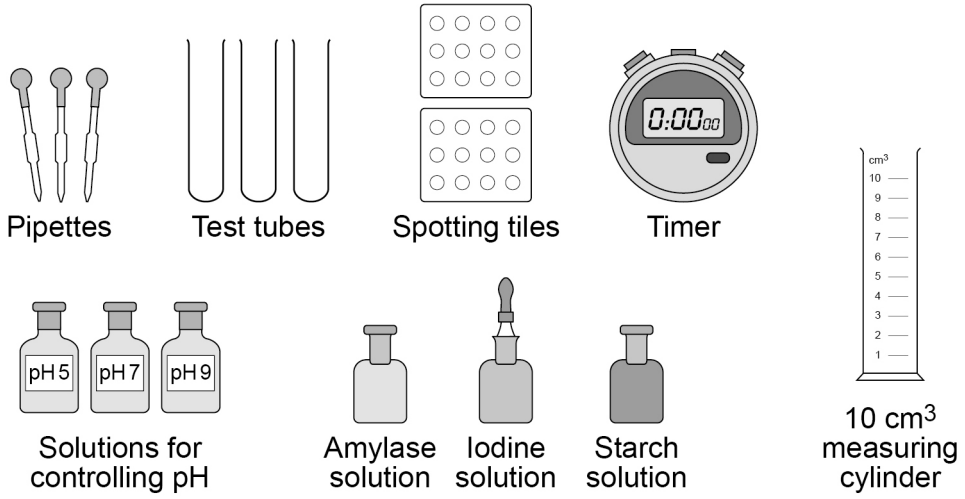
Do not write outside the box

0 5 . 9 Amylase is an enzyme which breaks down starch.

A student investigated the effect of pH on the rate of starch breakdown by amylase.

Figure 4 shows some of the apparatus the student used.

Figure 4



Describe a method to investigate the effect of pH on the rate of starch breakdown by amylase.

You should include the apparatus shown in **Figure 4**.

[6 marks]

Do not write outside the box

17

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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0 6 A root is a plant organ.

Plant roots contain many different types of tissue.

0 6 . 1 What is a tissue?

[1 mark]

_____

_____

0 6 . 2 Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

[1 mark]

_____

In the past many drugs were extracted from plants.

0 6 . 3 Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

_____

Question 6 continues on the next page

Do not write outside the box

Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

Table 5 shows information about where chemical **A** is found.

Table 5

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 6 . 4 The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

[1 mark]

Do not write outside the box

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 5**.

0 6 . 5 Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

Mass of chemical **A** = _____ mg

0 6 . 6 Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

Question 6 continues on the next page

Do not write outside the box

Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

0 6 . 7 It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

0 6 . 8 Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

[1 mark]

_____

_____

Do not write outside the box

0 6 . 9 How can scientists be sure that claims about new drugs are valid?

[1 mark]

Tick (✓) **one** box.

Advertise the claims on social media. ☐

Ask an international company to produce the drug. ☐

Have the claims peer reviewed. ☐

Publish the claims in a newspaper. ☐

13

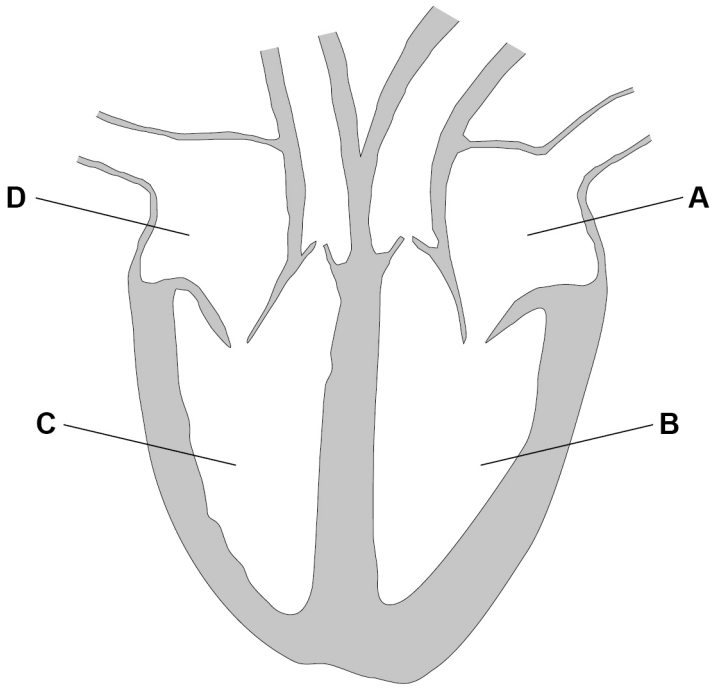
Turn over for the next question

Do not write outside the box

0 7 This question is about the circulatory system.

Figure 5 shows the human heart.

Figure 5



0 7 . 1 Which part of the heart receives oxygenated blood from the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 7 . 2 Which part of the heart pumps deoxygenated blood to the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

0 7 . 3 A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

[1 mark]

Tick (✓) **one** box.

Left atrium ☐

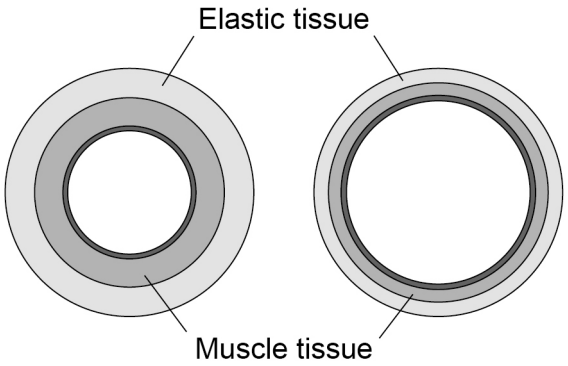
Left ventricle ☐

Right atrium ☐

Right ventricle ☐

0 7 . 4 **Figure 6** shows a cross section of an artery and of a vein.

Figure 6



Describe **two** ways that the structure of an artery is different from the structure of a vein.

[2 marks]

1 _____

_____

2 _____

_____

Question 7 continues on the next page

Do not write outside the box

0 7 . 5 In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

Table 6 shows how a blockage in a coronary artery affects blood flow.

Table 6

Percentage (%) of coronary artery that is blocked	Blood flow in cm^3/minute
0	100
10	64
20	42
50	8
80	2

Describe the trend shown in **Table 6**.

[1 mark]

Do not write outside the box

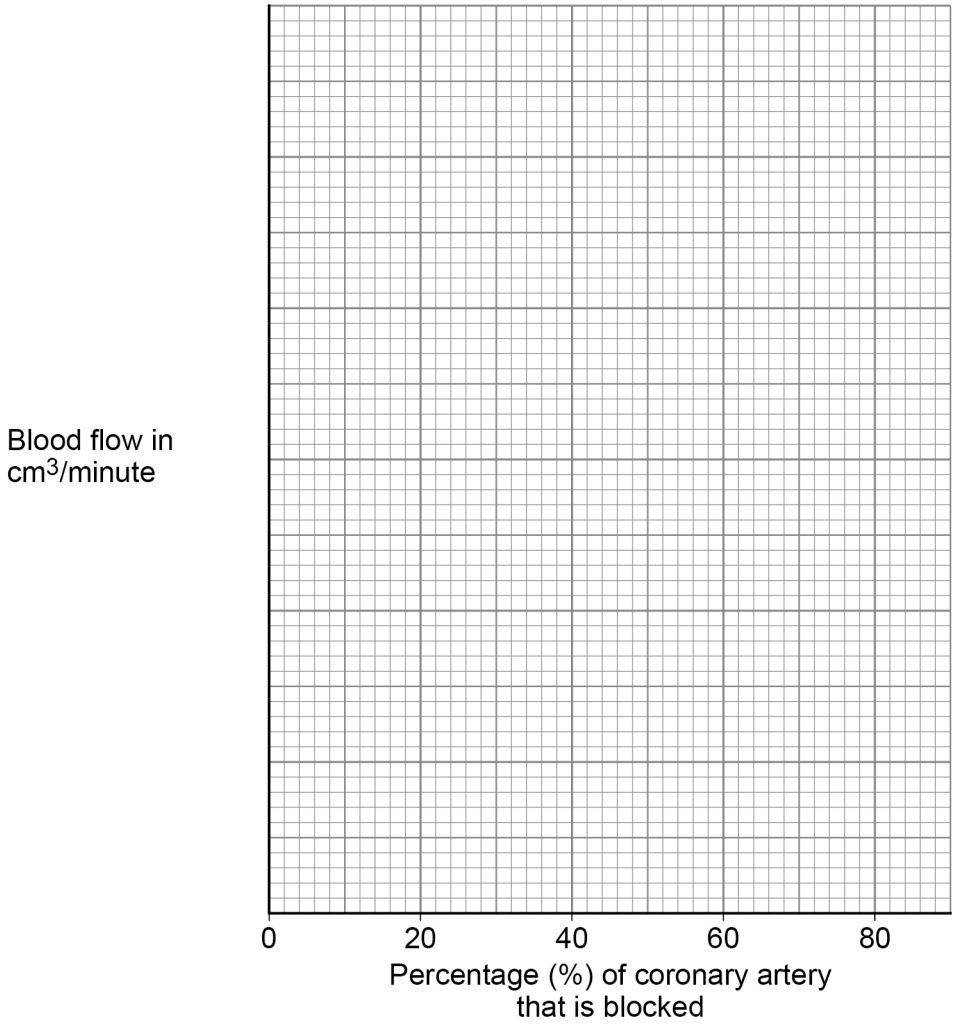
0 7 . 6 Complete **Figure 7**.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

Figure 7



0 7 . 7 Predict the blood flow in a coronary artery with a 35% blockage.

Use **Figure 7**.

[1 mark]

Blood flow = _____ cm^3/minute

Question 7 continues on the next page

Do not write outside the box

0 7 . 8 Explain the effect of a partly blocked coronary artery on the human body.

[6 marks]

0 7 . 9 There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

[2 marks]

19

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**
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